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COMPARISON OF COSTS OF PRODUCING FIELD GROWN PLANTS IN U.S.D.A. PLANT HARDINESS ZONES FIVE AND SIX DIFFERENTIATED BY SPECIES OF PLANT

By

Reed D. Taylor and Harold H. Kneen*

Department of Agricultural Economics
and Rural Sociology
The Ohio State University
Columbus, Ohio 43210

*Associate Professor, Department of Agricultural Economics and Rural Sociology, Ohio State University and Director of Marketing, Studebaker Nurseries, Inc., New Carlisle, Ohio.

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INTRODUCTION

To make more informed decisions as to whether to enter, leave, or expand field production, nurserymen require production, marketing and financial information. Changes and competition in the industry make it imperative that nurserymen systematically determine production costs.

Comprehensive cost models have recently been developed for container grown crops in U.S.D.A. Plant Hardiness Zone 6 (3), for field grown crops in U.S.D.A Plant Hardiness Zones 7 and 8 (1), and for field grown crops in U.S.D.A. Plant Hardiness Zones 5 and 6 (2). This paper presents a small portion of the information provided in the latter study. Information provided by these studies provide a basis for decision-making for those evaluating the profitability of either establishing a new field nursery, expanding an existing field nursery or phasing out of field production.

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*Associate Professor, Department of Agricultural Economics and Rural Sociology, Ohio State University and Director of Marketing, Studebaker Nurseries, Inc., New Carlisle, Ohio.

OBJECTIVES

The general objective of the complete study (2) was to develop the resources and costs associated with two model nurseries differentiated by size, including the delineation of representative field production systems. Specific objectives were to:

1. Model a series of production systems that would accommodate a majority of the plant species being field-grown in U.S.D.A. Plant Hardiness Zones 5 and 6.
2. Analyze the important species of plants commonly grown in the field in U.S.D.A. Plant Hardiness Zones 5 and 6, and assign each of them to one of five designated groups based on similarities of growing and production requirements.
3. Choose one species from each of the five groups as representative of that group for detailed cost analysis.
4. Design physical facilities including land areas, land improvements, irrigation systems, buildings, machine and equipment components, for two sizes of commercial field nurseries based on the model production systems.

This paper summarizes the analyses of the larger (200 acre) commercial field nursery.

MATERIALS AND METHODS

A model firm was synthesized using the conceptual framework of economic engineering wherein the "best proven practice" was

included for the model. The complete model included developing an appropriate production cycle; schematic drawings of the physical layout, including buildings and irrigation system; lists of equipment and other items; a complete sequence by month and year of nursery operational steps beginning with land preparation and ending with loading the finished product for wholesale distribution; and budgets for fixed and variable costs (2). Commonly grown nursery stock was divided into five cultural groups: slow growing evergreens, fast growing evergreens, deciduous shrubs, shade trees, and ornamental trees. While not all inclusive, the groups do permit a range of per unit costs to be developed as they relate to input costs and cultural factors. One species of plant was chosen to represent each cultural group. The production system provided for propagating shrubs (Taxus, Juniperus, and Viburnum) and for purchasing liners for trees (Acer rubrum and Malus).

Data for this study were obtained from wholesale nurseries and nursery suppliers in the North Central region during the late Autumn and Winter of 1984 and the Spring of 1985. Price quotations obtained were for the 1985 production season. The basic goals in synthesizing production facilities were to minimize labor expenses, flow and movement of plant material and equipment, maximize the number of salable plants and allow future expansion. The nursery reported on consisted of 200 acres with 170 acres being growing space and 30 acres production facilities, holding area, field bed area and roads. Twenty percent of the

growing space was assigned to each of the cultural groups.

Costs were established for all factors of production including management and invested capital. Since most nurseries use cash rather than accrual procedures, the analyses were completed on a "cash" basis. Capital requirements for establishing the nursery were first determined. Second, physical factors associated with the nursery and annual shipment requirements were established. Third production systems for the enterprises budgeted were described. Fourth, annual fixed costs were calculated. Fifth, estimated variable costs for each of the five groupings of plants were determined. Sixth, summaries were made of fixed and variable costs for each cultural group (Tables 1 and 2).

RESULTS AND DISCUSSION

Annual fixed costs associated with capital investment (depreciation, interest, insurance and taxes) were $270,110. An additional $163,425 was allocated for general overhead and $10,990 for interest on general overhead, insurance, and taxes making a total of $444,525 annual fixed costs. These costs were divided equally between the five plant groups, with each group receiving an assessment of $88,903 (Table 1). It was felt that the most reasonable way of assigning fixed costs is by area rather than plant. Once the physical facility is provided, fixed costs are incurred at essentially the same amount regardless of how the nursery facility is used. On a per-salable-plant basis,

there was a considerable difference in fixed costs when they were differentiated by plant group (Table 2). They were: $4.90 for Group I (Taxus), $3.48 for Group II (Juniperus), $3.27 for Group III (Viburnum), $10.87 for Group IV (Acer rubrum), and $7.43 for Group V (Malus) and averaged $4.88 for all groups (Table 2). Fixed costs as a percent of total costs ranged from 30% to 52% and averaged 39% for all groups (Table 1).

Nurserymen having established facilities might well consider fixed costs to be lower than those reported here. This is especially true if they calculate depreciation and repairs on the original value of land improvements, buildings, machinery and equipment and if they place a low value on their own management input. Good management for planning purposes, however, dictates computing depreciation and repairs on replacement value rather than on original cost. It also dictates placing a value on managerial time that would be comparable to salaries paid in competitive firms.

Total variable costs by plant group were $81,524 for Group I (Taxus), $91,476 for Group II (Juniperus), $103,079 for Group III (Viburnum), $202,260 for Group IV (Acer rubrum), and $206,687 for Group V (Malus). Total for all groups was $685,026 (Table 1). On a per-salable-plant basis variable costs were $4.49 for Group I, $3.59 for Group II, $3.79 for Group III, $24.74 for Group IV, $17.30 for Group V and averaged $7.55 for all groups (Table 2). Variable costs ranged from 48% to 70% of total cost and averaged 61% for all groups.

Total annual costs are the summation of fixed and variable costs. They were $170,427 for Group I (Taxus), $180,379 for Group II (Juniperus), $191,982 for Group III (Viburum), $291,163 for Group IV (Acer rubrum), and $295,590 for Group V (Malus). They totaled $1,129,541 for all groups (Table 1). On a per-salable-plant basis total costs were $9.39 for Group I, $7.07 for Group II, $7.06 for Group III, $35.61 for Group IV, and $24.73 for Group V and averaged $12.43 for all groups (Table 2).

SUMMARY

Total costs per salable plant differentiated by species ranged from $7.06 to $35.61 and averaged $12.43 for all species. Fixed costs per salable plant ranged from $3.27 to $10.87 and averaged $4.88. Fixed costs as a percentage of total costs ranged from 30% to 52% and averaged 39% for all species. Variable costs per salable plant showed substantial differences between plant species. They ranged from $3.59 to $24.74 and averaged $7.55 for all species. Variable costs as a percentage of total costs ranged from 48% to 70% and averaged 61% for all species.

LITERATURE CITED

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TABLE 1.--Summary of Annual Fixed, Variable and Total Costs (Dollars) of Operating a 200 Acre* Field Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1985.

Item	Group I (Taxus)	Group II (Juniperus)	Group III (Viburnum)	Group IV (Acer rubrum)	Group V (Malus)	Total
Fixed Cost						
Land and improvements	21,716	21,716	21,716	21,716	21,716	108,578**
Buildings	6,811	6,811	6,811	6,811	6,811	34,055**
Machinery and equipment	25,495	25,495	25,495	25,495	25,495	127,477**
General overhead	32,685	32,685	32,685	32,685	32,685	163,425**
Interest on general overhead, insurance and taxes	2,198	2,198	2,198	2,198	2,198	10,990**
Subtotal	88,903	88,903	88,903	88,903	88,903	444,525**
Variable Costs						
Propagation	3,560	2,540	2,641	***	***	8,741
Materials	17,070	19,561	20,875	113,506	107,815	278,827
Machinery and equipment	11,739	12,039	14,138	24,747	29,945	92,608
Labor	44,540	52,158	59,590	52,558	57,228	266,074
Interest on operating capital	4,615	5,178	5,835	11,449	11,699	38,776
Subtotal	81,524	91,476	103,079	202,260	206,687	685,026
TOTAL	170,427	180,379	191,982	291,163	295,590	1,129,541**

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.

**Individual figures do not always add to the total due to rounding.

***Tree liners were purchased rather than propogated. Liner costs were included under materials.

TABLE 2.--Summary of Fixed, Variable, and Total Costs (Dollars) per Salable Plant of Operating a 200 Acre* Field Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1985.

Item	Group I (Taxus)		Group II (Juniperus)		Group III (Viburnum)		Group IV (Acer rubrum)		Group V (Malus)		Average	
	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost	Cost per Salable Plant	Percent of Total Cost
Fixed Cost Items												
Land and Improvements	1.20	(13)	.85	(12)	.80	(11)	2.66	(7)	1.82	(7)	1.19	(10)
Buildings	.38	(4)	.27	(4)	.25	(4)	.83	(2)	.57	(2)	.37	(3)
Machinery and Equipment	1.40	(15)	1.00	(14)	.94	(13)	3.11	(9)	2.13	(9)	1.40	(11)
General Overhead	1.80	(19)	1.28	(18)	1.20	(17)	4.00	(11)	2.73	(11)	1.80	(14)
Interest on General Overhead, Insurance, and Taxes	.12	(1)	.08	(1)	.08	(1)	.27	(1)	.18	(1)	.12	(1)
Subtotal	4.90	(52)	3.48	(49)	3.27	(46)	10.87	(30)	7.43	(30)	4.88	(39)

Table 2 Cont.

Variable Cost Items											
Propagation	.20	(2)	.10	(1)	.10	(1)	**		**		.10	(1)
Materials	.94	(10)	.77	(11)	.77	(11)	13.88	(39)	9.02	(37)	3.07	(25)
Machinery and												
Equipment	.65	(7)	.47	(7)	.52	(8)	3.03	(9)	2.51	(10)	1.02	(8)
Labor	2.45	(26)	2.05	(29)	2.19	(31)	6.43	(18)	4.79	(19)	2.93	(24)
Interest on												
Operating Capital	.25	(3)	.20	(3)	.21	(3)	1.40	(4)	.98	(4)	.43	(3)
Subtotal	4.49	(48)	3.59	(51)	3.79	(54)	24.74	(70)	17.30	(70)	7.55	(61)
Total Costs per												
Salable Plant	9.39	(100)	7.07	(100)	7.06	(100)	35.61	(100)	24.73	(100)	12.43	(100)

*Total Nursery - 200 acres, 175 acres of growing space, 25 acres production facilities, holding & field bed area, roads, etc.

**Tree liners were purchased rather than propagated. Liner costs were included under materials.